NEVADA COOPERATIVE SNOW SURVEYS

NEVADA SNOW SURVEY BULLETIN

APRIL 1946

Nevada Agricultural Experiment Station
Reno, Nevada

NEVADA COOPERATIVE SNOW SURVEYS

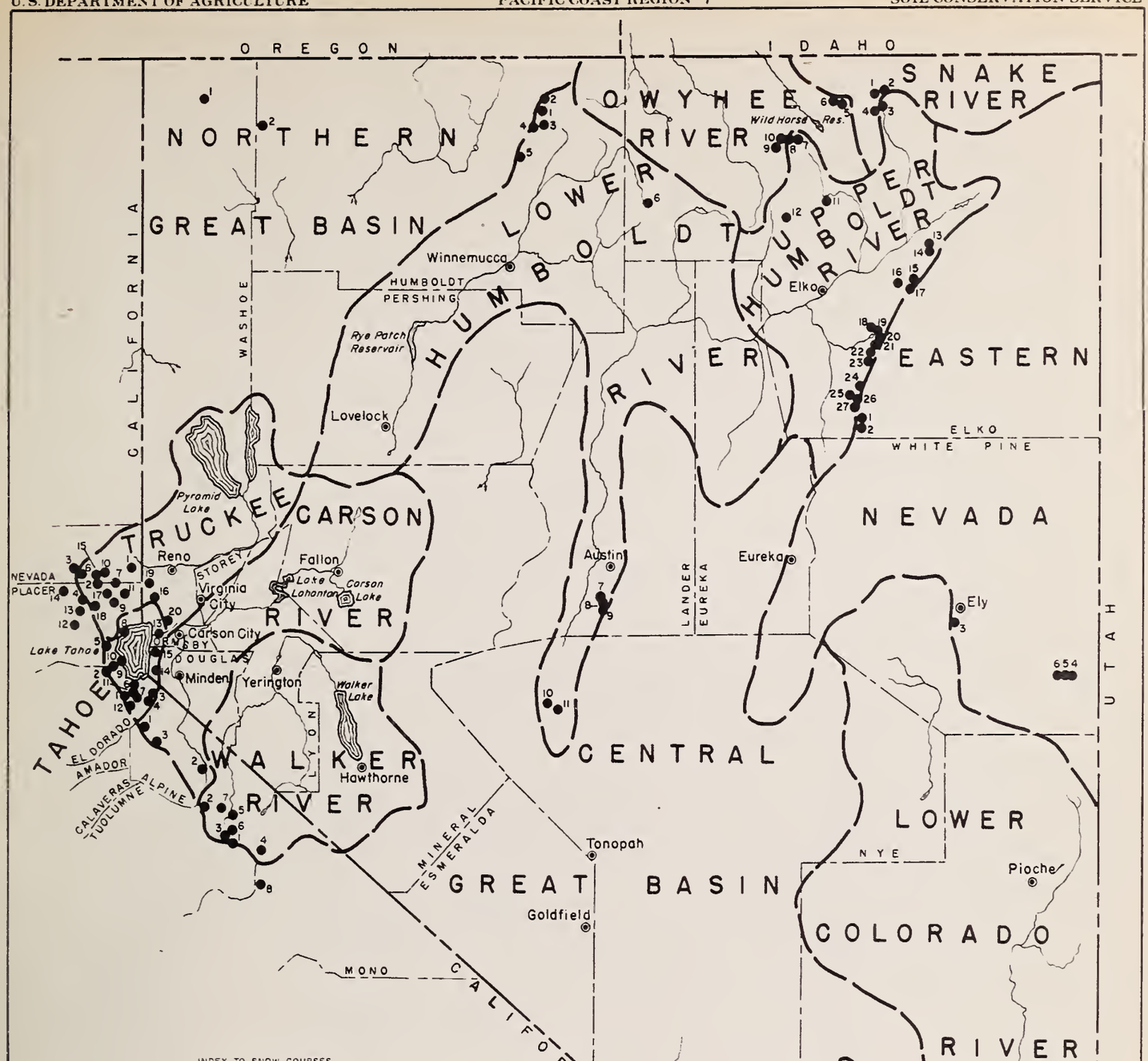
Seasonal Snow Survey and Kindred Data with Forecast of Streamflow in Nevada

April 1, 1946

Part I. Eastern Sierra Nevada
By Nevada Forecast Committee:
H. P. Boardman, George Devore,
Leigh Sanford

Part II. Humboldt River Basins
Eastern and Southern Nevada
and Nevada National Wildlife
Refuges
By J. E. Church, H.P. Boardman
and Clyde E. Houston

Nevada Agricultural Experiment Station
Reno, Nevada



INDEX TO SNOW COURSES

NUMBER	NAME	ELEVATION
	SNAKE RIVER	
1.	Bear Creek	7,800
2.	Fox Creek	6,800
3.	Mary's River	8,000
4.	76 Creek	7,100
5.	Gold Creek	6,600
6.	Big Bend	6,700
	OWYHEE RIVER	
1.	Lower Buckskin	6,700
2.	Upper Buckskin	7.200
3.	Martin Creek	6,700
4.	Granite Peak	7,800
5.	Gold Creek	6,600
6.	Big Bend	6,700
7.	Fry Canyon	6,700
8.	Rodeo Flat	5,800
9.	Lower Jack Creek	5,800
10.	Upper Jack Creek	7,250
11.	Tremewan Ranch	5,700
12.	Taylor Canyon	5,200
	UPPER HUMBOLDT RIVER	
1.	Bear Creek	7,800
2.	Fox Creek	6,800
3.	Mary's River	8,000
4.	76 Creek	7,100
5.	Gold Creek	6,600
6.	Big Bend	6,700
7.	Fry Canyon	6,700
8.	Rodeo Flat	5,800
9.	Lower Jack Creek	5,800
10.	Upper Jack Creek	7,250
11.	Tremewan Ranch	5,700
12.	Taylor Canyon	5,200
13.	Lower Trout Creek	6,900
14.	Upper Trout Creek	8,500
15.	Dorsey Basin	8,100
16.	Ryan Ranch	5,800
17.	Dry Creek	6,500
18.	Lamoille # 1	7,100
19.	Lamoille # 2	7,500
20.	Lamoille # 3	7,700
21.	Lamoille # 4	8,000
22.	Lamoille # 5	8,700
23.	Lamoille # 6	8,700
24.	Green Mountain	8,000
25.	Harrison Pass # 1	6,800
26.	Harrison Pass # 2	7,400
27.	Corral Canyon	8,500

NUMBER	NAME	ELEVATION
	TRUCKEE BASIN	
1.(Cal.)	Granite Peak	8,200
2.(Cal.)	Independence Lake	7,000
3.(Cal.)	Webber Peak	8,000
4.(Cal.)	Donner Summit	6,900
5.(Cal.)	Herd Creek	7,000
6.(Cal.)	Webber Lake	7,000
7.(Cal.)	Sare Hen Creek	8,500
8.(Cal.)	Tahoe City	6,250
9.(Cal.)	Truckee # 2	5,400
10.(Cal.)	Independence Creek	6,300
11.(Cal.)	Boca # 2	5,900
12.(Cal.)	Furnace Flat	6,600
13.(Cal.)	Fordyce Lake	6,500
14.(Cal.)	Soda Springs	6,750
15.(Cal.)	Independence Camp	7,000
16.	Mt. Rose	10,000
17.(Cal.)	Truckee Ranger Station	6,000
18.(Cal.)	Donner Lake	5,[illegible]80
19.	Big Meadows	8,500
20.	Little Valley	6,300
	CENTRAL GREAT BASIN	
1.	Rainbow Canyon	7,800
2.	Kyle Canyon	8,200
3.	Lee Canyon #1	6,300
4.	Lee Canyon #2	9,000
5.	Clark Canyon	5,000
6.	Trough Springs	8,500
	EASTERN NEVADA	
1.	Cave Creek	7,000
2.	Hager Canyon	6,500
3.	Murray Summit	7,280
4.	Baker # 1	7,950
5.	Baker # 2	8,930
6.	Baker # 3	9,230
7.		
	UPPER HUMBOLDT RIVER	
1.	Lower Buckskin	6,700
2.	Upper Buckskin	7,2.0
3.	Martin Creek	6,7.0
4.	Granite Peak	7,800
5.	Lamence Creek	6,600
6.	Midas	7,200
7.	Big Creek Camp Ground	6,000
8.	Big Creek Mine	7,000
9.	Upper Big Creek	8,000
10.	Lower Corral	7,500
11.	Upper Corral	8,500

NUMBER	NAME	ELEVATION
	CARSON BASIN	
1.(Cal.)	Carson Pass	8,600
2. (Cal.	Poison Flat	7,900
3.(Cal.)	Blue Lakes	8,000
	NORTHERN GREAT BASIN	
1.	Bald Mountain	6,720
2.	Mahogany Mountain	5,880
	WALKER BASIN	
1.(Cal.)	Center Mountain	9,400
2.(Cal.)	Sonora Pass	8,800
3.(Cal.)	Buckeye Forks	6,500
4.(Cal.)	Dunderburg Peak	6,400
5.(Cal.)	Willow Flat	5,250
6.(Cal.)	Buckeye Roughs	7,900
7.(Cal.)	Leavitt Meadows	7,200
8.(Cal.)	Tioga Pass	9,900
	TAHOE BASIN	
1.(Cal.)	Lake Lucille	6,400
2.(Cal.)	Rubicon # 1	8,100
3.(Cal.)	Hagens Meadow	8,000
4.(Cal.)	Freel Bench	7,300
5.(Cal.)	Ward Creek	7,000
6.(Cal.)	Richardsons	6,800
7.(Cal.)	Upper Truckee	6,400
8.(Cal.)	Tahoe City	6,250
9.(Cal.)	Rubicon # 2	7,500
10.(Cal.)	Rubicon # 3	6,700
11.(Cal.)	Richardsons # 2	6,500
12.(Cal.)	Echo Summit	7,500
13.	Marlette Lake	8,000
14.	Daggetts Pass	7,380
15.	Glenbrook # 2	6,900
16.	Mt. Rose	10,000

NEVADA SNOW COURSES

November 28, 1945

25 0 25 50

SCALE IN MILES

TABLE OF CONTENTS

FORECAST SUMMARY

In the Eastern Sierra, the Lake Tahoe and Truckee River Basins will provide their normal water, the Carson River (below much diversion for irrigation) will flow only 65.2 percent of normal and the East and West Walker 89.0 and 78.5 percent respectively. The period covers April-July. All lakes and reservoirs are abundantly filled.

In the Humboldt Basin the March accumulation of snow has exceeded the usual. If the summer precipitation attains even reasonable expectency, the forecast made March 1 should be realized.

On the upper end of the feeders and of the Little Humboldt the runoff should be normal but at the lower end should increase because of the water table to 160-180 percent. On the main Humboldt, the discharge bids fair to rise even to 200 percent.

On the Southern Feeders and in Reese River Basin the heavy increase in snow cover in March will build up their flows by 30 to 65 percent of normal respectively. For the Reese River this may mean a supply of 125 percent of normal.

In Eastern Nevada the increase in snow cover and precipitation indicates a water supply of 75 percent of usual.

In Southern Nevada, the snow cover water-supply can scarcely exceed 50 percent of the March-July normal. This applies also to Lake Mead.

At the Sheldon Antelope Refuge, the snow cover March 1 was one-half greater than last year but by April 1 it had melted.

At the Ruby Lake Wildlife Refuge the season will apparently be normal.

PART I. EASTERN SIERRA BASINS

APRIL 1, 1946 SNOW SURVEY DATA

Snow Survey Stations	Elevation of Snow Course Ft.	Date of 1946 Snow Survey	Depth of Snow In.	Dens. of Snow % Water	Water Equivalent Apr. 1	Normal Water Equivalent Apr. 1 In.	1946 Seas. % of Norm.	Last Year % of Normal (1945)
CARSON BASIN								
Crest-West Carson								
Carson Pass	8600	3/22	83.5	40.6	33.9	(48)	70.6	84.0
Blue Lakes	8000	4/3	114.3	35.5	40.6	48.1	84.4	84.6
East Carson								
Poison Flat	7900	3/28	30.4	35.6	14.8***	(18)	82.2	102.8
WALKER BASIN								
West Walker								
Sonora Pass	8800	4/4	79.7	35.6	28.4	(31)	91.6	88.1
Leavitt Meadows	7200	4/4	25.8	29.5	7.6	(16)	47.5	73.1
Willow Flat	8250	4/5	41.8	33.4	14.0	(16)	87.5	
East Walker								
Center Mountain	9400	4/3-4	110.5ϕ	18.8	20.8	45.7	45.5	100.7
Buckeye Forks	8500	4/2	67.0	31.3	21.0	26.0	80.8	83.1
Buckeye Roughs	7900	4/2	63.4	29.3	18.6	25.9	71.8	78.0
Dunderberg Peak	8400	4/5	60.3	30.5	18.4	(45)	40.9	49.3
MONO BASIN								
Crest								
Tioga Pass	9900	4/1	85.5	37.5	32.1	(31)	103.5	111.6

***The storm after the survey was made, March 28th, added 4 inches to the water content bringing it up to 14.8.

ϕ Results not too accurate, 15 inches of ice blocking the tube.

April-July, 1946

Basin or Stream	Normal Feet	Seasonal Forecast Probable % of Normal	Probable Amount Feet	Possible Minimum % of Normal	Possible Minimum Amount Feet
Rise of Tahoe--April 1 to High Water.....	1.68	101.2	1.70	89.3	1.50
1/Maximum Elevation of Tahoe with Gates Closed (July 15)			6229.45		6229.15
2/Maximum Elevation of Tahoe with Gates Regulated.....			6229.10		
3/Truckee Exclusive of Tahoe (Natural Flow.....	325,700	97.6	318,000	89.1	290,000
Carson River at Fort Churchill.....	230,000	65.2	150,000	52.2	120,000
West Walker near Coleville	191,200	78.5	150,000	68.0	130,000
4/East Walker near Bridgeport Dam.....	73,000	89.0	65,000	68.5	50,000

1/ Assuming gates kept closed.
2/ When necessary gates are opened so that elevation of lake will not exceed 6229.1.
3/ Corrected for changes in Little Truckee Reservoir storage and Donner Lake.
4/ The forecast period for the East Walker is April-August because of late melting of snow in high altitudes and on the Northeastern slope of the Sawtooth Range west of Bridgeport.

Distribution of April-July Runoff in Typical Streams--
Per Cent of Total April-July Runoff

	Truckee at Farad Excl. of Tahoe	Carson at Clifton	West Walker at Coleville
April.....	32	19	11
May.....	38	36	29
June.....	23	34	37
July.....	7	11	23
April-July.....	100.0	100.0	100.0

A retardation in the earlier months of the series assures an increase in the later months and vice versa.

Table A, below, shows what Lake Tahoe is able to supply at various elevations with gates wide open. Table B, below, shows the need of drawing from the lake or other storage during the summer and fall to maintain a flow of 500 cubic feet per second at Farad.

A. Draft Possible at Various Elevations:

Elev. (Ft.)	Draft (C.F.S.)	Elev. (Ft.)	Draft (C.F.S.)
6223.0	0	6225.5	520
6223.5	24	6226.0	730
6224.0	88	6227.0	1160
6224.5	183	6228.0	1600
6225.0	325	6229.0	2060

One foot depth on Tahoe is equivalent to 123,000 Acre Feet.

B. Natural Flow of Truckee River at Farad, Exclusive of Tahoe (Much Affected by Rains) August-October:

	Normal Acre Feet	Second Feet
August	7485	122
September	5800	98
October	6545	106

Winter Precipitation

*Typical Progress through winter for Central Sierra Region:

Dec.-March Date	Dec.-March % Due	Nov.-March % Due	Nov.-March Date
Dec. 1	0	12	Dec. 1
Jan. 1	21	31	Jan. 1
Feb. 1	50	5[illegible]	Feb. 1
Mar. 1	76	7[illegible]	Mar. 1
Apr. 1	100	100	Apr. 1

†Seasonal Progress

Tahoe City
Nov.-March 1945-46

Date	% of Seasonal	Actual Inches	% of Normal Due
Dec. 1	19	4.85	166
Jan. 1	63	15.99	214
Feb. 1	71	18.01	132
Mar. 1	82	20.80	95
Apr. 1		25.33	102

*Based on U.S.W.B. Revised Normals, % Due being averages for nine U.S.W.B. Stations in Central Sierra.

†Percent of Normal Due based on U.S.W.B. Revised Normals for Tahoe City.

Nov.-March normal.....24.81

Dec.-March normal.....21.89

PART II. HUMBOLDT RIVER BASINS
EASTERN AND SOUTHERN NEVADA
NEVADA NATIONAL WILDLIFE REFUGES

HUMBOLDT BASIN

Forecast Data for Present Season

1945-1946

Percent of Normal

1. Snow Cover and Precipitation

Snow Cover March 1	High-Level	Low-Level	Precipitation Nov-Feb.
Upper Humboldt	102.7	58.9	86.8
Little Humboldt	102.5		91.4
Reese River	65.2		92.6

Snow Cover April 1 Percent of March 1 Normal	High-Level	Low-Level	Precipitation Nov-Mch. (Wells-Elko-Lamoille only)	Precipitation March
	121.8	56.9	125.2	142.0
Upper Humboldt				
North Feeders	112.5	58.9		121.8
South Feeders	131.1	54.9		162.2
Lamoille	149.4			166.8
Lower Humboldt			(Paradise-Orovada)	
Little Humboldt-Quinn	100.7		(Paradise-Orovada) 118.7	243.8
Reese River	155.7		(Austin) 162.6	352.6

2. Temperature during March

	Temp. Dept.	Mean temp. above freezing
Upper Humboldt Elko	-0.8°F	17.6°F
Lower Humboldt Winnemucca	+0.8	22.3
Reese River Austin	+5.7	16.7

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]
Upper Horizontal	102.7	[illegible]	[illegible]
Middle Horizontal	102.8		[illegible]
[illegible]	[illegible]		[illegible]
[illegible] Panel 1 Percent of Total (Corrected)	High-Level	Low-Level	Precipitation Nov-Mar. (Gulla-Tiber-Benolli only)	Water
	151.5	24.9	158.5	112.0
Upper Lambdin				
North Fork	112.8	[illegible]		[illegible]
South Fork	101.1	80.0		[illegible]
Lambdin	[illegible]			[illegible]
Lower Lambdin			(Fremont-Orestimba)	
Little Lambdin-Orestimba	1[illegible].7		(Fremont-Orestimba) 1[illegible].7	[illegible]
Water Shed	[illegible]		(Ansley) 1[illegible].0	[illegible]

[illegible]

[illegible]	[illegible]	[illegible]
Upper Lambdin Lake	[illegible]	[illegible]
Lower Lambdin Lake	40.4	[illegible]
[illegible] Ansley	[illegible]	[illegible]

3. Snow Cover Change in March

	Normal Key Courses only (1935-1941) in. (Water equiv. in.)	1946 General Average (Water equiv. in.)	Gain or Loss over Percentage Snow Survey Mar. 1 High-Level	Low-Level
Upper Humboldt North Feeders	-0.02	0.0	+9.8	-21.4
South Feeders	+1.7	+4.4	+28.4	+17.4
Lamoille	+1.7	+4.4	+38.5	
Little Humboldt-Quinn River		-0.4	+ 4.8	
Roese River		+4.0	+90.5	

4. March Runoff

	Normal	1946 Acre Feet	Percentage
Humboldt at Palisade	32,600 A.F.	65,540	201.0
Martin Creek near Paradise Valley	3,610	4,130	114.4

5. Well Measurements - To Water

March 1

Upper Humboldt Valley (Average 7 wells)		Lamoille Valley (Average 5 wells)	
Normal	1946	Normal	1946
11.62 ft.	10.70 ft.	4.24 ft.	4.20 ft.

[illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	-6.03	[illegible]	[illegible]	-[illegible]
[illegible]	+1.7	+[illegible]	+[illegible]	+17.[illegible]
[illegible]	+1.7	+1.[illegible]	+[illegible]	
[illegible]		-0.[illegible]	+ [illegible]	
[illegible]		+.0	+[illegible]	

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

Month 1

[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	Normal	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Forecast

The precipitation during March in the Humboldt Basin has been high but uneven and with the exception of the Little Humboldt the accumulation of snow cover has exceeded the usual. The mean temperature during March except possibly in Reese River Basin was less than 1°F from normal.

The runoff of the Humboldt River during the month at Palisade was 201.0 percent of normal and of Martin Creek in the Little Humboldt Basin was 114.4 percent.

If the summer precipitation attains even reasonable expectancy, the forecast made March 1 should be realized. The heavy increase in snow cover during March on the South Feeders and Reese River will increase their flow 30 to 65 percent of normal respectively.

1. Upper Humboldt

The average snow cover of the Upper Humboldt is now 121.8 percent; the Northern Feeders 112.5 percent, the Southern Feeders 131.1 percent, and Lamoille Creek 149.4 percent. The March precipitation on the Southern Feeders was 35-45 percent of normal above that of the Northern Feeders.

The water table, which has continued its effect of a full 100 percent of normal during March and as much during April, must become a factor in weighting the forecast. This factor will be as high as x2 in the watersoaked alluvial valley of the main Humboldt, x1.6 on the feeder streams below their meadow areas, and will disappear on the steeper slopes above the canyon mouths.

To the last class belong upper Marys (not yet gaged), Secret and upper Starr, upper Lamoille, upper South Fork. The main Humboldt at Palisade represents the first and extreme class.

Because of the uncertainty of the weight to be given distorting factors, such as water table and precipitation during runoff, only the probable flow is forecasted. The normal relationship of snow cover April 1 to March 1 and seasonal runoff awaits further analysis.

	Normal Flow (Acre-feet) March-July	Normal Flow (Acre-feet) March September	March - July Percent of Snow Cover	March - July Factor of Water Table	March - July Acre-feet	March-September Percent of Runoff	March-September Acre-feet
Northern Feeders							
Upper Marys River (Gaging Station planned)							
Lower Marys River near Deeth	29,800*		102	x1.6= 163%	48,570*	100	
Lower North Fork at Devils Gate	30,700*		102	x1.6= 163%	50,040*	100	
Southern Feeders							
Secret Creek			110	None		110	
Upper Starr Creek			110	None		110	
Upper Lamoille Creek at Power House	26,040		111	None	28,900	111	
Lower Lamoille Creek (Gage abandoned)			111	x1.6= 178%		178	
Upper South Fork near Lee	44,000		99	None	43,600	99	
Lower South Fork near Elko	81,910		99	x1.6= 158%	129,400	158	
Main Humboldt River							
At Elko			103	x2=206			
Above Carlin below South Fork			103	x2=206			
At Palisade	215,000 (Median 203,300)	220,700 (Median 207,200)	103	x2=206	442,900	206	454,640

*April-July only

2. Lower Humboldt

(a) Little Humboldt-Quinn Rivers

The forecast of 96 percent of normal for the mountain slopes of the Little Humboldt-Quinn Rivers Basin represents all streams in the area including the East Fork of the Little Humboldt.

The temperature departure during March has been only +0.8°F. and the precipitation 243.8 percent of normal. The March runoff of upper Martin Creek has been 114.4 percent in close harmony with snow cover and March precipitation. The abundant precipitation has already provided one-half of summer precipitation.

Only the normal for Martin Creek is available, but other streams for which flow data are being accumulated are included in the forecast.

	Normal Flow (Acre-feet)		1946				
	March-July	March-Sept.	March - July			March-Sept.	
			Percent of Snow Cover	Factor of Water Table	Acre-feet	Percent of Run-off	Acre-feet
Upper Martin Creek near Paradise Valley	20,320	21,440	96	None	19,500	96	20,580
Lower Martin Creek in Paradise Valley			96	x1.6= 154%	31,290	154	33,020
Little Humboldt at Chimney Dam Site (North and East Forks)			96	Small		96	
Little Humboldt near Paradise Valley (Below meadows)			96	x1.6(?)= 154(?)		154(?)	
Cottonwood Creek in Paradise Valley			96	x1.6= 154		154	

(b) Reese River

The Reese River Basin has made a phenomenal recovery since March 1 when low-altitude snow was entirely lacking on the courses and both snow cover and winter precipitation were only 90 percent of normal.

On April 1 the snow had increased to 155.7 percent of the March 1 normal and the precipitation for the month was 352.6 percent of the March-normal. Nearly normal snow also was found on the lower courses. The temperature departure was only +0.5°F.

There are no measurements of streamflow. The season's water should be well above normal and may approach 125 percent even with only moderate summer precipitation.

April 1 Snow Survey Data
1. Upper Humboldt Basin (Cont.)

	Elevation feet	Date	Snow depth inches	Density percent	Water equivalent ins.	Normal water equivalent Mar. 1	Percentage of normal Mar. 1		Seasonal precipitation Percentage of normal at U. S. Weather Bureau Stations March
Southern Feeders									
Trout-Starr-Secret Creeks									
Trout Creek	8,500	Apr. 11	79.4	39.9	31.7	20.2	156.9	120.4	Arthur-Wells (6,500-5,633 ft.)
Trout Creek	6,900	Apr. 11	15.7	33.1	5.2	6.2	83.9		Normal 1.66 in.
									2.97 in.; 178.9%
Dorsey Basin	8,100	Apr. 12	49.7	41.8	20.8	11.0	189.1	127.6	
Dry Creek	6,500	Apr. 12	10.0	39.0	3.9	5.9	66.1		
Ryan Ranch	5,800	Apr. 12	T		T	2.4			
Lamoille-Rabbit Creeks									
Lamoille Canyon	8,700	Apr. 14	88.2	41.5	36.6	21.3	171.8		Lamoille-Elko (6,290-5,077 ft.)
Lamoille Canyon	8,700+	Apr. 14	88.6	40.1	35.5	22.5	157.8		Normal 1.90 in.
Lamoille Canyon	8,000	Apr. 14	65.2	39.4	25.7	17.1	150.3	149.4	3.17 in.; 166.8%
Lamoille Canyon	7,700	Apr. 13	46.6	37.5	17.5	12.5	140.0		
Lamoille Canyon	7,300	Apr. 13	35.8	38.0	13.6	9.6	141.7		
Lamoille Canyon	7,100	Apr. 13	35.3	35.1	12.4	9.2	134.8		

[illegible]

April 1 Snow Survey Data
1. Upper Humboldt Basin (Cont.)

	Elevation feet	Date	Snow depth inches	Density percent	Water equivalent ins.	Normal water equivalent March 1	Percentage of normal March 1		Seasonal precipitation Percentage of normal at U. S. Weather Bureau Stations March
Southern Feeders (Cont.)									
South Fork-Ruby Lake									
Corral Canyon	8,500	Apr.13	58.8	34.5	20.3	14.1	144.0)		Jiggs-Ruby Lake (5,450-6,200 ft.)
Green Mountain	8,000	Apr.12	39.5	38.2	15.1	13.7	110.2)	99.4	Normal Jiggs 1.83
Harrison Pass No.2	7,400	Apr.11	17.4	27.0	4.7	6.1	77.0)		2.71 in.; 155.7%
Harrison Pass No.1	6,600	Apr.11	9.9	25.2	2.5	5.7	43.9)		
Hager Canyon	8,500	Apr. 3	57.4	38.3	22.0	18.2	120.9		
Cave Creek	7,000	Apr. 3	42.1	37.8	15.9	15.8	100.6		

Average of Southern Feeders	Higher Levels	131.1*	
	Lower Levels	55.0	162.2*
Average Upper Humboldt	Higher Levels	121.8	
	Lower Levels	57.0	142.0

*The average for the Southern Feeders is computed by weighting the three groups of stations representing South Fork, Lamoille Creek and Starr Creek on the basis of 2, 1 and 1/2, representing their relative contributions to the flow of the main Humboldt.

[illegible]

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April 1 Snow Survey Data
11. Lower Humboldt Basin

Temperature departure March, Winnemucca (4,287 ft.) +0.8°F (Mean 40.8°F)
Mean temperature above freezing 22.3°F (Normal 10.4°F)

	Elevation feet	Date	Snow depth inches	Density percent	Water equivalent ins.	Normal water equivalent Mar. 1	Percentage of normal Mar. 1		Seasonal precipitation Percentage of normal at U. S. Weather Bureau Stations March
Rock Creek-Little Humboldt									
Midas	7,200	Apr. 1	4.7	34.7	1.6	6.6	24.2		Paradise Valley-Orovada (4,650-4,300 ft.) Normal 0.89 2.17 in; 243.8%
Lamance Creek	6,000	Apr. 6	24.7	38.1	9.4	10.7	87.8)		
Granite Peak	7,800	Apr. 6	48.9	37.4	18.3	9.5	192.6)		
Martin Creek R.S.	6,700	Apr. 7	17.8	31.5	5.6	7.2	77.8)	100.7	
Upper Buckskin Mt.	7,200	Apr. 8	22.5	33.8	7.6	10.2	74.5)		
Lower Buckskin Mt.	6,700	Apr. 8	18.4	31.5	5.8	8.2	70.7)		

Average Little Humboldt Basin

Reese River Basin

Temperature departure March, Austin (6,594 ft.) +5.7°F (Mean 36.6°F)
Mean temperature above freezing 16.7°F (Normal 7.7°F)

Upper Big Creek	8,000	Apr. 4	51.1	31.5	16.1	6.7	240.3)		Austin (6,594 ft.) Normal 1.52 in. 5.36 in.; 352.6%
Cabin Course (Middle)		Apr. 4	25.0	28.3	7.1	3.0	236.7)		
Camp Ground (Lower)		Apr. 4	9.6	19.8	1.9	3.0	63.3)	155.7	
Upper Corral	8,500	Apr. 3	33.8	27.2	9.2	6.8	135.3)		
Lower Corral	7,500	Apr. 2	15.9	21.4	3.4	3.3	103.0)		

Change in Snow Cover at all Stations during March 1946
(Inches Water)
1. Upper Humboldt Basin

Temperature departure Elko (5,077 ft.) -0.8°F (Mean 36.8°F);
Mean temperature above freezing 17.6°F Normal 10.1°F

Northern Feeders

Marys River

	Bear Creek (7,800 ft.)	Fox Creek (6,800 ft.)	Marys River (8,000 ft.)	Big Bend (7,000 ft.)	Gold Creek R.S. (6,600 ft.)	Precipitation Jarbidge-Mala Vista (6,100-5,585 ft.)
March 1	17.2	9.4	16.9	10.1	7.3	2.48 in.
April 1	23.1	8.6		10.9	5.5	
Gain or loss	+5.9	-.8		+0.8	-1.8	

North Fork

	Jack Creek (7,250 ft.)	Jack Creek (6,800 ft.)	Rodeo Flat (6,800 ft.)	Fry Canyon (6,700 ft.)	Tremewan Ranch (5,700 ft.)	Precipitation North Fork-Tuscarora-Owyhee (6,500-5,400 ft.) Normal 1.42 in. 1.73 in; 121.8%
March 1	9.7	5.2	9.5	8.8	2.5	
April 1	12.0	3.1	11.2	9.7	0	
Gain or loss	+2.3	-2.1	+1.7	+0.9	-2.5	

Susie-Maggie Creeks

	Taylor Canyon (6,200 ft.)
March 1	6.7
April 1	3.5
Gain or loss	- 3.2

Average Northern Feeders Gain or loss in snow cover +0.12 in.; Precip. +0.31 ; temp. dept.-0.8°F.(Mean temp. above freezing 17.6 oF) Dept.

Change in Snow Cover at all Stations during March 1945
(Inches water)

1. Upper Humboldt Basin (Cont.)

Southern Feeders

Trout-Starr-Secret Creeks

	Trout Creek (8,500 ft.)	Trout Creek (6,900 ft.)	Dorsey Basin (8,100 ft.)	Dry Creek (6,500 ft.)	Ryan Ranch (5,800 ft.)
March 1			11.1	5.9	0.9
April 1	31.7	5.2	20.8	3.9	T
Gain or loss			+ 9.7	- 2.0	-0.9

Precipitation at Arthur-Wells (6,500-5,633 ft.)
Normal 1.66 in.
2.97 in.

Lamoille-Rabbit Creeks

March	Lamoille (8,700 ft.)	Lamoille (8,700+)	Lamoille (8,000 ft.)	Lamoille (7,700 ft.)	Lamoille (7,300 ft.)	Lamoille (7,100 ft.)
March 1	30.1	24.7	17.4	12.7	10.0	9.6
April 1	36.6	35.5	25.7	17.5	13.6	12.4
Gain or loss	+6.5	+10.9	+ 9.3	+4.9	+3.6	+2.8

Precipitation at Lamoille-Elko (6,200-5,077 ft.)
Normal 1.90 in.
3.17 in.

South Fork-Ruby Lake

	Corral Canyon (8,500 ft.)	Green Mt. (8,000 ft.)	Harrison Pass #2 (7,400 ft.)	Harrison Pass #1 (6,600 ft.)	Hagar Canyon (8,500 ft.)	Cave Creek (7,000 ft.)
March 1	18.3	12.8	4.6	4.4	17.9	15.7
April 1	20.3	10.1	4.7	2.5	22.0	15.9
Gain or loss	+2.0	-2.7	+0.1	-1.9	+ 4.1	+0.2

Predipitation Jiggs-Ruby Lake
Normal 1.83(Jiggs)
2.71 in.

Average Southern Feeders Gain or loss in snow cover +3.1 in.; Precip. Dept. +1.2 in.; Temp. dept. -0.8°F. Mean above freezing 17.6°F.
Runoff from Upper Basin at Palisade during March 65,540 A.F.. (Normal 32,600 A.F.) 201.0%

Change in Snow Cover at all Stations during March 1946
(Inches water)

11. Lower Humboldt Basin
Temperature departure Winnemucca (4,287 ft.) +0.8°F (Mean 40.8°F)
Mean temperature above freezing 22.3°F (Normal 10.4°F)

Rock Creek-Little Humboldt

	Midas (7,000 ft.)
March 1	7.1
April 1	1.6
Gain or loss	-5.5

Little Humboldt Basin

	Lamance Creek (6,000 ft.)	Granite Peak (7,800 ft.)	Martin Creek R.S. (6,700 ft.)	Upper Buckskin (7,200 ft.)	Lower Buckskin (6,700 ft.)	Precipitation Paradise-Orovada (4,650-4,300 ft.)
March 1	10.3	13.0	6.7	6.8	7.1	Normal 0.89 in.
April 1	9.4	18.3	5.6	7.6	5.8	2.17 in.;
Gain or loss	-0.9	+5.3	-1.1	+0.8	-1.3	243.8%

Average Little Humboldt Basin Gain or loss in snow cover -0.5 in.; Precip. dept. +1.28 in.; Temp. dept. +0.8°F
Mean temperature above freezing 22.3°F
Martin Creek 4,130 A.F. (Normal 3,000 A.F.); 137.7%

Reese River Basin

Temperature departure Austin (6,594 ft.) +5.7°F (Mean 36.6°F)
Mean temperature above freezing 16.7°F (Normal 7.7°F)

	Upper Big Cr. (8,000 ft.)	Cabin Course (Middle	Camp Ground (Lower)	Upper Corral (8,500 ft.)	Lower Corral (7,500 ft.)	Precipitation Austin (6,594 ft.)
March 1	9.5	3.5	T	4.6	0	Normal 1.52 in.
April 1	16.1	7.1	1.9	9.2	3.4	5.36 in.;
Gain or loss	+6.6	+3.6	+ 1.9	+4.6	+ 3.4	352.6%

Average Reese River Basin. Gain or loss in snow cover +4.0 in. Precipitation dept. +3.84 in. Temperature departure +5.7°F. Mean temperature above freezing 16.7°F). No runoff records available.

Main Humboldt River Precipitation stations only.

Precipitation at Battle Mountain-Winnemucca-Rye Patch Dam-Lovelock (4,513-3,977 ft.). Normal 0.65 in. (Except Rye Patch) 1.64 in. Inc.; 253.8% Inc.

Runoff Palisade 65,540 A.F. (Normal 32,600 A.F.); 201.0%

Storage in Pitt-Taylor Reservoirs 19,000 A. F.

Runoff Callahan Gaging Station near Imlay (abandoned)

Rye Patch Reservoir storage Apr. 1, 187,100 A. F. (0.75 ft. above top of spillway gates. Maximum storage capacity 178,000 A. F.

Past Record 1943-1946 of Change in Water Content of Snow Cover at Key Stations at Higher Levels during March

	Northern Feeders		Precipitation in inches (U. S. W. B.) North Fork-Tuscarora-Owyhee (5,400-6,500 ft.) Normal 1.42 in.		Southern Feeders				Precipitation in inches (U. S. W. B.) Lamoille 6,100 ft.) Normal 2.83 in.		Mean Temperature Elko 5,077 ft.		Snow Cover April 1 (Percent of March 1 Norm.)	Runoff to Pilot for March	
	Fox Creek (6,800 ft.)	Big Bend (7,000 ft.)	Total	Dept.	Lamoille (7,100 ft.)	Lamoille (7,300 ft.)	Lamoille (7,700 ft.)	Lamoille (8,700 ft.)	Total	Dept.	Departure (Normal 37.6°F)	Mean temp. above freezing (Norm. 10.1°F)		Percent of normal March Runoff (Normal 52,600 A.F.)*	Percent of normal March-July (Normal 215,000 A.F.)
1943															
March 1	9.6	16.3			11.7	12.0	13.7	31.6							
April 1		15.3			10.7	10.8	13.5	35.0							
Gain or loss		-1.0	0.71	-0.71	-1.0	-1.2	-0.2	+3.4	1.64	-1.19	+0.1	17.0	89.5	340.5	51.6
1944															
March 1	9.5	6.4			9.3	10.5	13.0	21.7							
April 1		5.6			10.2	10.6	12.2	21.7							
Gain or loss		-0.8	0.34	-1.08	+0.9	+0.1	-0.3	0	1.34	-1.49	-5.0	9.2	73.6	92.0	13.9
1945															
March 1	6.9	8.1			10.5	10.3	12.4	19.1							
April 1	10.8	12.1			17.4	15.0	17.6	23.5							
Gain or loss	+3.9	+4.0	2.28	+0.86	+6.9	+4.7	+5.2	+4.4	4.53	+1.70	-4.8	12.6	113.6 Inc.	136.5	20.7
1946															
March 1	9.4	10.1			9.6	10.0	12.7	30.1							
April 1	8.6	10.9			12.4	13.6	17.5	36.6							
Gain or loss	-0.8	+0.8	1.73	+0.31	+2.8	+3.6	+4.8	+6.5			-0.8	17.6	Upper Levels 121.8 Lower Levels 56.9	201.0	50.5
Average for period 1935-1941	-0.2	-0.01	1.31	-0.11	+0.8	+0.8	+1.5	+3.6	2.04	-0.79	-0.5	9.3			

*Relationship of March normal to March-July normal is 15.2%

Change in Snow Cover at Low Levels during March 1943-1946
(Inches water)

	Northern Feeders					Southern Feeders	
	Fry Canyon (6,700 ft.)	Gold Creek (6,600 ft.)	Tremewan Rch. (5,700 ft.)	Taylor Can.: (6,200 ft.):	Harrison Pass (6,600 ft.)	Dry Creek (6,500 ft.)	Ryan Ranch (5,800 ft.)
1943							
March 1	10.7	10.9	2.3	4.4	2.3+	4.8	0.8
April 1	8.7	8.9	0	0	0	0	0
Gain or loss	-2.0	-2.0	-2.3	-4.4	-2.3+	-4.8	-0.8
1944							
March 1	8.2	4.0	2.9	4.2	5.0	5.9	4.0
April 1	6.5	0	0	0	0		
Gain or loss	-1.7	-4.0+	-2.9+	-4.2+	-5.0		
1945							
March 1	8.6	6.3	2.2	7.6	5.9	5.8	3.1
April 1	12.7	9.1	0	9.4	7.6	10.5	3.1
Gain or loss	+4.1	+2.8	-2.2+	+1.8	+1.7	+4.7	0
1946							
March 1	8.8	7.3	2.5	6.7	4.4	5.9	0.9
April 1	9.7	5.5	0	3.5	2.5	3.9	0
Gain or loss	+0.9	+1.8	-2.5	-3.2	-1.9	-2.0	-0.9+

Average gain or loss in snow cover: 1943.....-2.7 in.;
1944.....-3.2 in.; 1945.....+1.8 in.; 1946..... -1.6 in.

EASTERN NEVADA

Forecast

The snow cover in Eastern Nevada March 1 was 64.2 percent of normal and the precipitation at Ely was 51 percent. But April 1 the snow cover was 78.4 percent of the March 1 normal and the March precipitation at Ely was 102.5 percent. At Lehman caves the percentage was 172.3 percent. The temperature for March was +2.9°F.

The increase in snow cover and precipitation should indicate a water supply of 75 percent providing precipitation during the remainder of the runoff season continues normal.

There are no normals of runoff.

April 1 Snow Survey Data
Eastern Nevada

Temperature departure March, Ely (6,257 ft.) +2.9°F (Mean 35.4°F
Mean temperature above freezing 16.5°F
Mean temperature Lehman Caves Natl. Mon. (7,200 ft.) 36.6°F Mean above freezing 18.9°F

	Elevation feet	Date	Snow depth inches	Density percent	Water equivalent ins.	Normal water equivalent March 1	Percentage of normal March 1		Seasonal precipitation Percentage of normal at U. S. Weather Bureau Stations March
Steptoe Valley									
Murray Summit	7,250	Apr. 2	12.4	23.4	2.9	4.2	69.0		Ely (6,257 ft.) Normal 1.19 in. 1.22 in.; 102.5%
Baker Creek									
Baker Creek #3	9,230	Apr. 2	55.1	27.4	15.1	13.0	116.1)		Lehman Caves (7,200 ft.)
Baker Creek #2	8,950	Apr. 2	52.2	27.8	14.5	19.4	74.7)	87.8	Normal 1.12 in.
Baker Creek #1	7,950	Apr. 2	18.1	29.3	5.3	7.3	72.6)		1.93 in; 172.3%
Average Eastern Nevada							78.4		

Change in Snow Cover during March 1943-1946
(Inches of Water)

	Steptoe Valley Murray Summit (7,250 ft.)	Precipitation (U. S. W. B.) In inches and percentage of normal at Ely (6,257 ft.) Normal 1.19 in.	Baker Creek Baker Creek #3 (9,250 ft.)	Baker Creek Baker Creek #2 (8,950 ft.)	Baker Creek Baker Creek #1 (7,950 ft.)	Precipitation (U.S. W. B.) In inches and percentage of normal at Lehman Caves Nat'l Mon. (7,200 ft.) Normal 1.12 in.
1943						
March 1	5.0		13.0	12.8	6.0	
April 1	0	0.44 in.;	16.9	16.2	5.6	1.15 in.
Gain or loss	-5.0+	37.0%	+3.9	+3.4	-0.4	102.7%
1944						
March 1	5.2	0.89 in.;		17.0	10.1	
April 1	5.3	74.8%	22.5	20.5	7.2	2.25 in.
Gain or loss	+0.1			+3.5	-2.9	200.9%
1945						
March 1	4.6	2.01 in.;		14.5	7.1	
April 1	5.2	168.9%	26.4	23.1	10.1	2.80 in.
Gain or loss	+0.6			+8.6	+3.0	250%
1946						
March 1	3.1	1.22 in.;	9.2	9.6	3.2	1.93 in.
April 1	2.9	102.5%	15.1	14.5	5.3	172.3%
Gain or loss	-0.2		+5.9	+4.9	+2.1	

SOUTHERN NEVADA

Forecast

(a) Mount Charleston

Although the March precipitation was wholly lacking at Las Vegas, 1.54 in. fell at Kyle Canyon near the snow fields. The snow cover actually increased during March from 44.8 percent of the March 1 normal to 60.6 percent. However, the March 1 snow cover was only 52 percent of 1945. The snow cover water supply can scarcely exceed 50 percent of the March-July normal.

(b) Lake Mead

The storage in Lake Mead April 1 was 18,000,000 acre-feet. The snow cover in the Colorado Basin weighted by the amount of water contributed by the larger tributaries was 68.7 percent of the April 1 normal. The net expected flow at Bright Angel Creek above Lake Mead is 53.5 percent of the April-July normal or 4,815,000 acre-feet.

April 1 Snow Survey Data
Southern Nevada

Temperature departure Kyle Canyon R.S. (Mean 34.8°F Temp. above freezing 15.2°F

	Elevation feet	Date	Snow depth inches	Density percent	Water equivalent ins.	Normal water equivalent March 1	Percentage of normal March 1	Seasonal precipitation Percentage of normal at U. S. Weather Bureau Stations March
Charleston Mountain								
Kyle Canyon	8,200	Mar. 31	31.6	26.3	8.3	13.2	58.4	Kyle Canyon Ranger Station 1.54 in.
Rainbow Canyon	7,800	Mar. 30	21.5	35.8	7.7	14.3	51.7	
Lee Canyon	9,000	Apr. 1	35.5	27.4	9.7	14.0	66.0	
Lee Canyon	8,300	Apr. 1	26.6	29.0	7.7	12.2	66.4	Las Vegas Airport T in. (Normal 0.34 in.); 0%
Clark Canyon	9,000	Apr. 1	28.8	28.9	8.3			
Trough Springs	8,500	Mar. 29	13.7	32.8	4.5			

Change in Snow Cover During March 1943-1946
Charleston Mountains

	Kyle Canyon (8,200 ft.)	Rainbow Canyon (7,800 ft.)	Lee Canyon (9,000 ft.)	Lee Canyon (8,300 ft.)	Clark Canyon (9,000 ft.)	Trough Sps. (8,500 ft.)	Precipitation in inches at Kyle Canyon R.S. (7,165 ft.) March
1943							
March 1	15.7	16.7	17.4	13.9			
April 1		15.0		7.3			Las Vegas Airport 153.0%
Gain or loss		-1.7		-6.6			
1944							
March 1	12.9	12.2	8.9	9.3			Kyle Canyon R.S. 0.43 in.
April 1	13.0	11.2	7.7	-7.6			Las Vegas A.P. 0. 0.06 in. 17.6%
Gain or loss	+0.1	-1.0	-1.2	-1.7			
1945							
March 1	9.9	9.5	13.3	13.6			
April 1	15.7	16.0	15.2	15.6	14.3		Kyle Canyon R.S. 4.00
Gain or loss	+5.8	+6.5	+1.9	+2.0			Las Vegas A.P. 1.58 in.; 464.7%
1946							
March 1	6.3	7.1	6.3	4.4	4.9	2.9	
April 1	8.3	7.7	9.7	7.7	8.3	4.5	Kyle Canyon R.S. 1.54 in.;
Gain or loss	+2.0	+0.6	+3.4	+3.3	+3.4	+1.6	Las Vegas A.P. T; 0%
Average 4 years (1941-44)	+0.1	-0.8	+1.4	=1.2			

Charleston Division of Nevada National Forest Snow Courses

(Tabulation of April 1 snow course averages for years 1941 through 1946, six-year mean of snow depth and water content for each course, and comparison of 1946 course averages with the six-year mean. Snow depth and water content are expressed in inches.)

H. C. Hoffman

Name of Snow Course	No. of Sam. Taken	Period 1941 to 1946 inclusive: 1941 Snow Depth	1941 Water Cont.	1942 Snow Depth	1942 Water Cont.	1943 Snow Depth	1943 Water Cont.	1944 Snow Depth	1944 Water Cont.	1945 Snow Depth	1945 Water Cont.	1946 Snow Depth	1946 Water Cont.	6-year Mean Snow Dep.	6-year Mean Water Cont.	% of 6 Yr. Mean avgs. are that 1946 course Snow Dep.	% of 6 Yr. Mean avgs. are that 1946 course Water Cont.
Rainbow Canyon 7800 ft. elev.	13	58.6	21.3	30.9	11.0	42.3	15.0	34.2	10.4	47.9	16.0	21.5	7.7	39.2	13.6	54.9	56.6
Kyle Canyon 8200 ft. elev.	17	51.4	18.5	26.3	9.5	-	-	29.4	11.2	48.6	15.7	31.6	8.3	37.5	12.6	84.3	65.9
Lee Canyon No. 1 8300 ft. elev.	13	47.6	16.3	31.1	11.3	23.1	7.3	24.3	7.6	51.0	15.6	26.6	7.7	34.0	11.0	78.3	70.0
Lee Canyon No. 2 9000 ft. elev.	13	61.2	20.8	44.6	15.2	-	-	24.2	7.7	49.1	15.2	35.5	9.7	42.9	13.7	82.7	70.6
Trough Springs 8500 ft. elev.	9	Established Dec. 1945; first measured in 1946										13.7	4.5	-	-	-	
Clark Canyon 9000 ft. elev.	13	Established and first measured on 3-28-45								46.3	14.3	28.8	8.3	-	-	-	
Totals	78	218.8	76.9	132.9	47.0	65.4	22.3	112.1	36.9	242.9	71.8	157.7	46.2	153.6	50.9		
Means	XX	54.7	19.2	33.2	11.8	32.7	11.1	28.0	9.2	48.6	14.3	26.3	7.7	38.4	12.7	68.5	60.6

WILDLIFE REFUGES

Forecast

1. Sheldon Antelope Refuge

The temperature departure for March was only +0.4°F. and the precipitation 88.5 percent for the month. The water equivalent of the snow cover March 1, 1945 was 3.1 in. but on March 1, 1946 it was 4.8 in. Yet on April 1 only a trace remained.

No normals have yet been accumulated.

2. Ruby Lake Wildlife Refuge

The snow cover during March has increased from 98.9 percent of March 1 normal to 112.8 percent. The temperature departure for the month was -0.8°F and the precipitation 119.6 percent. The season will apparently be normal.

April 1 Snow Survey Data
Wildlife Refuges

Sheldon National Antelope Refuge (Northern Washoe County)
Temperature departure March, Sheldon (6,500 ft.) +0.4°F (Mean 32.0°F
Mean temperature above freezing 11.1°F (Normal 10.2°F

	Elevation feet	Date	Snow depth inches	Density percent	Water equivalent ins.	Normal water equivalent March 1	Percentage of normal March 1	Seasonal precipitation Percentage of normal at U. S. Weather Bureau Stations March
Bald Mountain	6,720	Apr. 1	Trace			4.8		Sheldon (6,500 ft.) Normal 1.13 1.00 in.; 88.5%

Ruby Lake National Wildlife Refuge, (Southern Elko County)
Temperature departure March, Elko -0.8°F (Mean 36.8°F)
Mean temperature above freezing 17.6°F (Normal 10.1°F

Hagar Canyon	8,500	Apr. 3	57.4	38.3	22.0	18.2	111.1	Arthur (6,500 ft.) Normal 2.24 in. 2.68 in.; 119.6%
Cave Creek	7,000	Apr. 3	42.1	37.8	15.9	15.8	114.4	Ruby Lake 2.58 in.

[illegible]

[illegible]

[illegible]

Gain or Loss of Snow Cover during March 1943-1946
(Inches Water)

	Sheldon National Antelope Refuge		Precipitation in inches (U. S. W. B.) Sheldon (6,500 ft.) and percentage of normal. Normal 1.13 in.	Ruby Lake Wildlife Refuge		Precipitation in inches (U.S. W. B.) Ruby Lake and percentage of normal
	Bald Mountain (6,720 ft.)	Mahogany Mountain (5,680 ft.)		Hagar Canyon (8,500 ft.)	Cave Creek (7,000 ft.)	
1943						
March 1	7.7	0.7	0.71 in.;	19.1	14.6	
April 1	4.3	0	62.8%	17.1	8.8	1.48 in.
Gain or loss	- 3.4	-0.7+		-2.0	-5.8	Arthur 11.6%
1944						
March 1	3.4	2.3	0.65 in.;			Arthur 0.56
April 1	0	0	57.5%			in.; 25.0%
Gain or loss	-3.4+	-2.3+				
1945						
March 1	3.3	No survey made	1.00 in.;	17.0	15.5	1.47 in.
April 1	5.1		80.5%	23.4	20.0	Arthur
Gain or loss	+1.8			+6.4	+ 4.5	121.9%
1946						
March 1	3.1	Station abandoned	1.00 in.;	17.9	15.7	2.58 in.
April 1	T		88.5%	22.0	15.9	119.6%
Gain or loss	-3.1			+4.1	+0.2	Arthur

Normal Summer Runoff

March-July
and
and March-September

	Upper Humboldt at Palisade			Martin Creek in Paradise Valley	
	37 Yr. Average 1903/04-1939/40	Seasonal 1946	Normal Median Adjusted 1903/06 and 1912/43	Normal	Seasonal 1946
March	32,600	65,540	25,600	3,610	4,130
April	47,200		39,700	6,330	
May	54,500		51,000	6,530	
June	60,400		70,500	2,950	
July	20,300		16,500	900	
Total	215,000		203,300	20,320	
Aug.	3,600		2,200	620	
Sept.	2,100		1,700	500	
March-Sept.	220,700		207,200	21,440	

CRITICAL NEEDS

The delay in obtaining prompt records during the storm of early April reemphasizes the needs listed in 1945.

1. A larger field personnel to provide substitute observers familiar with the location of the courses.

2. Abundant shelter cabins near the individual groups of courses to provide opportunity to wait for favorable conditions of snow and weather for surveying. These should be equipped with radio.

3. Motor sleds to reduce the physical exhaustion caused by soft snow and driving storms. Some day soon the helicopter will take their place.

The snow-surveyor's purpose should be and is to obtain the records however long the delay.

Snow Surveyors
April 1, 1946

Truckee Basin

A. Chase
J. Church
P. Cowgill
G. Doll
B. Eddy
J. Glynn
G. Hart
V. Hart
A. Hanson
G. Hilsabeck
E. Johansen
J. Johansen
E. Raiford
F. Steiner, Jr.

Tahoe Basin

F. Barkley
R. Butler
D. Gaiennie
F. Giovannoni
M. Herz
W. Herz
H. Leonard
E. Marsh
H. Oakley
I. Simmonds
W. Simmonds
E. Wise
H. Wolfe

Carson Basin

D. Dean
F. Dean
H. Freece
R. Gardner
N. Green
A. Hansen
L. Smith

West Walker

C. Houston
G. Swainston

East Walker

L. Jenkins
B. Mosher

Upper Humboldt

P. Arcimis
T. Brierley
G. Blackett
A. Corta
H. Corta
H. Dill
G. Hill
R. Kuehner
W. Lear
R. Mendive
L. Miller
P. Moore
E. Murphy, Jr.
J. Murphy
A. Rohwer
C. Sprague
A. Supp
A. Torgerson
S. Urriola

Lower Humboldt

V. Arzuaga
B. Crane
C. Gnevo
Q. Hansen
E. Pitts
L. Smith
E. Wilkerson
L. Wilkerson

Eastern Nevada

J. Barr
G. Southwick
R. Thomson
E. Yersin

Northern Great Basin

R. Norton

Central Great Basin

H. Hoffman
C. Houston

NEVADA COOPERATIVE SNOW SURVEYS

State

Nevada State Engineer
Nevada Agricultural Experiment Station
California Division of Water Resources
Colorado River Commission of Nevada

Federal

Soil Conservation Service
Forest Service
Weather Bureau
Bureau of Reclamation
Geological Survey
Fish and Wildlife Service

Public Utilities

Sierra Pacific Power Company
Elko-Lamoille Power Company
Wells Power Company

Organized Public Agencies

Truckee-Carson Irrigation District
Washoe County Water Conservation District
Walker River Irrigation District
Humboldt River Water Users

The conc...

Seasonal Snow Survey and Forecast of Stream Flow — April, 1946
Nevada Co-operative Snow Surveys

PART I—CENTRAL SIERRA QUADRANGLE

Including the Truckee, Tahoe, Carson and East and West Walker Basins of the Eastern Slope

CO-OPERATION

The organizations co-operating in the surveys of this region are: The Nevada Co-operative Snow Surveys, including the State of Nevada, through the State Engineer's office, the Truckee-Carson Irrigation District, the Washoe County Water Conservation District, the Walker River Irrigation District, and the Sierra Pacific Power Co.; the California Co-operative Snow Surveys headed by the Division of Water Resources of the Department of Public Works at Sacramento and including the Pacific Gas & Electric Co. and the Nevada Irrigation District, whose employees make the surveys of several of the courses used in this forecast; the U.S. Forest Service; and the Division of Irrigation of the U. S. Soil Conservation Service; the Nevada Agricultural Experiment Station at the University of Nevada. The Division of Irrigation is the organization which is developing and co-ordinating the snow surveys throughout the western states. All of the above organizations contribute financially to the work.

The U. S. Weather Bureau also co-operates in various ways.

PART II. Humboldt Basin and Miscellaneous is prepared under the direction of Dr. J. E. Church of the Nevada Agricultural Experiment Station, University of Nevada.

REVIEW OF LAST YEAR

The following table shows a comparison of the forecast made for 1945 and the actual results. It will be seen that the rise of Lake Tahoe and the runoff of the Truckee River checked reasonably close with the forecast. The Carson River discharged considerably more than expected but the footnote gives a probable explanation. As to the West Walker, the excess may have been due to similar excess precipitation during the spring but there are no good precipitation stations close to the Walker Basin so it is impossible to tell about spring and summer excess or deficiencies. The East Walker discharged very much more than expected as has been the case during several other years recently. We hope to make a study of ground water conditions in Bridgeport Valley in the future to aid in making a better forecast of that basin.

1945 RESULTS

BASIN OR STREAM		1945 Forecast		Actual Results	
	Normal Feet	Amount Feet	Percent of Normal	Percent of Normal	Amount Feet
*Rise of Tahoe April 1 to High Water	1.68	1.45	86.3	92.9	1.56
*Maximum Elevation		6228.10	July 10	July 11	6228.21
All for April-July Runoff except East Walker	Acre Feet	Acre Feet			Acre Feet
†Truckee River Natural Flow at Farad Exclusive of Tahoe	325,700	260,000	79.8	76.6	249,510
Carson River at Fort Churchill	230,000	152,000	66.1	91.4	210,167
West Walker near Coleville	191,200	162,000	84.7	99.7	190,690
‡East Walker below Bridgeport Dam	73,000	66,000	90.4	138.1	100,775

*Assuming gates closed (no outflow).

†Corrected for change in storage at Donner and Independence Lakes and Boca Reservoir, and for evaporation from Boca Reservoir.

‡April-August Runoff, corrected for change in storage and evaporation at Bridgeport Reservoir.

Precipitation in the Central Sierra was deficient in April but high in May and also in June at most of the Stations.

At Tamarack (Blue Lakes) the April-June precipitation was 3.3 inches above normal. At Woodfords the total for April-June was 3.76 which seems high for that location but there is no normal given for a comparison. These two should help account for the high runoff of the Carson at Fort Churchill.

OUTLOOK FOR 1946

Heavy early snows in November and December of 1945 gave an unusually good snow blanket on January 1 but a very dry January and a below-normal February changed the picture materially.

March ended with a good storm which brought the total water equivalent on April 1 up to from 95% to 112% of normal for most of the high-level snow courses in the Truckee and Tahoe basins with low-level courses generally yielding considerably lower returns.

Considerably lower results were obtained in the Carson and Walker basins and the snow surveyors had so much difficulty in sampling the Center Mountain course in the Walker basin that the results evidently do not tell the correct story.

Difficutly was experienced in securing personnel who could make the surveys at the desirable dates so several courses were surveyed after the middle of April. Some of these courses had lost greatly by melting.

The conclusions as to forecast of expected results are found in a table following the large table of April 1 snow survey data.

NOTES REGARDING THE VARIOUS BASINS

In the Truckee Basin the storage in Boca Reservoir on April 1 was 13,100 acre feet with a capacity of 40,900 and ample water in the snow of the Little Truckee Basin to fill it at least twice.

Lake Tahoe was at elevation 6227.75 on April 1, containing about 580,000 acre feet above elevation 6223.0, the rim at the outlet, the similar capacity at maximum elevation of 6229.10 being 750,000 acre feet. Some water will be drawn from the lake to prevent filling above the specified maximum of 6229.10.

On the Carson the storage in Lahontan Reservoir April 1 was 250,000 acre feet with a capacity of 286,000.

On the West Walker, Topaz Reservoir contained 59,400 acre feet April 1, the capacity being 60,000 acre feet.

On the East Walker, Bridgeport Reservoir was practically full April 1, the capacity being 42,500 acre feet. The discharge of the East Walker has exceeded the indications of the snow surveys for the last few years—probably due to the building up of ground water storage in Bridgeport Valley. It is hoped that a study of this ground water condition by means of wells can be started soon to aid in improved forecasts in future years.

1946

PROGRESS SNOW SURVEYS DURING THE WINTER

Basin	Snow Course	Altitude of Snow Course	1946 Date of Snow Survey	Depth of Snow Inches	Density % Water	Water Equivalent Inches	April 1 Normal Water Equivalent	Snow % of April 1 Normal	Year 1945 % of April 1 Normal	Year 1945 Date
South Yuba and Crest	Furnace Flat	6600	1/30	92.7	38.9	36.1	(59)	61.2	31.0	1/30
			3/5	109.3	45.2	49.4	(59)	83.7	55.9	2/26
	Fordyce Lake	6500	1/29	89.1	41.3	36.8	(51)	72.2	31.4	1/30
			3/4	97.5	39.7	38.7	(51)	75.9	52.5	2/27
	Soda Springs	6750	12/30	71.7	46.3	33.2	(42)	79.0		
			2/1	71.1	44.9	31.9	(42)	76.0	46.0	2/4
			3/1	84.6	43.1	36.5	(42)	86.9	56.7	2/28
	Donner Summit	6900	12/30	84.9	37.5	31.9	47.8	66.7		
			2/1	82.4	40.2	33.1	47.8	69.2	46.9	2/3
			3/1	97.5	42.0	41.0	47.8	85.8	52.1	2/28
	Ward Creek	7000	3/2	88.2	40.6	35.8	52.7	67.9	60.2	3/4
Truckee	Independence Camp	7000	3/3	66.2	38.1	25.2	(26.5)	95.1	64.5	3/9
	Sage Hen Creek	6500	2/2	46.9	36.2	17.0	(22)	77.3	56.4	2/11
			3/2	54.1	34.8	18.8	(22)	85.5	64.5	3/11
	Truckee No. 2	6400	2/3	49.5	32.1	15.9	(20)	79.5		
			3/2	40.0	34.8	16.0	(20)	80.0	63.5	3/4
	Donner Lake	5950	12/29	41.8	58.8	16.2	New Course			
			1/31	47.6	39.7	18.9	New Course			
			3/1	59.2	36.5	21.6	New Course			
	Truckee R. S.	6000	12/29	29.3	28.0	8.2	New Course			
			1/31	33.9	34.2	11.6	New Course			
			3/2	38.3	36.3	13.9	New Course			
Tahoe	Tahoe City	6250	1/3	32.1	32.4	10.4	15.9	65.4		
			1/31	28.2	35.5	10.0	15.9	62.9	29.6	2/4
			2/28	33.5	36.5	12.2	15.9	76.7	36.5	3/1
	Marlette Lake	8000	1/3	58.7	33.4	19.6	27.8	70.5		
			3/3	65.8	38.7	25.5	27.8	91.7	77.3	3/1
	Daggetts Pass	7350	2/2	33.7	31.2	10.5*	16.3	64.4		
			3/9	36.8	35.6	13.1	16.3	80.4	67.5	3/3
	Richardson No. 1	6500	3/10	30.3	32.3	9.8	(13)	75.4	33.8	3/3
	Richardson No. 2	6500	2/3	51.1	26.8	13.7	No Normal			
			3/10	45.6	33.3	15.2	No Normal			
	Echo Summit	7500	12/31	85.4	34.8	29.7	(40)	74.3		
			2/1	87.8	40.2	35.3	(40)	88.2	46.0	1/31
			2/28	104.9	40.0	42.0	(40)	105.0	70.8	3/1
	Upper Truckee	6400	3/10	25.4	40.6	10.3	(11)	93.6		
	Glenbrook No. 2	6900	3/9	48.5	30.9	15.0	(20)	75.0		
Carson	Blue Lakes	8000	1/31	74.6	37.2	27.8	48.1	57.8	57.4	2/4
			3/1	85.8	37.6	32.3	48.1	67.2	66.3	3/1
	Carson Pass	8600	1/21	59.1	40.4	23.9	(48)	50.0	38.5	1/25
			2/22	69.3	41.2	28.5	(48)	59.4	70.2	2/23
Mono	Tioga Pass	9900	3/2	58.0	39.7	23.0	(31)	74.2	88.4	2/26

*Incomplete.

RESERVOIR STORAGE MARCH 1

Lake Tahoe, Lake level ..... 6227.38 ft.
Maximum Permitted ..... 6229.1 ft.

Lake Lahontan, Storage ..... 229,406 acre feet
Capacity ..... 286,000 acre feet

Topaz Reservoir, Storage ..... 55,918 acre feet
Capacity approx. ..... 60,000 acre feet

Bridgeport Reservoir ..... 39,541 acre feet
Capacity approx. ..... 42,500 acre feet

APRIL 1, 1946, SNOW SURVEY DATA

Snow Survey Stations	Elevation of Snow Course Feet	Date of 1946 Snow Survey	Depth of Snow Inches	Density of Snow % Water	Water Equivalent Inches	Normal Water Equivalent April 1 Inches	1946 Seasonal % of Normal	Last Year % of Normal (1945)
TRUCKEE BASIN								
Crest and South Yuba								
Furnace Flat	6600	3/25	126.0	46.0	58.0	(59)	98.3	82.0
Fordyce Lake	6500	3/26	100.1	49.0	49.0	(51)	96.1	77.8
Soda Springs	6750	4/1	103.4	39.7	41.1	(42)	97.8	86.4
Donner Summit	6900	4/1	116.6	40.9	47.7	47.8	99.8	79.7
Ward Creek	7000	4/16	101.1	50.6	51.2	52.7	97.1	88.6
Little Truckee								
Webber Peak	8000	4/1	129.0	35.5	45.8	56.9	80.5	64.7
Webber Lake	7000	4/1	108.1	36.7	39.7	38.1	104.2	78.5
Independence Lake	7000	4/7	121.4	40.4	49.0	(47)	104.3	83.6
Independence Camp	7000	4/6	68.2	43.4	29.6	(26.5)	111.7	78.9
Independence Creek	6300	4/6	41.2	38.8	16.0	(18)	88.8	80.6
Sage Hen Creek	6500	4/8	55.4	39.7	22.0	(22)	100.0	82.7
Eastern Outposts								
Granite Peak	8200					24.7		
Big Meadow	8800	4/4	64.4	38.8	25.0	28.1	89.0	
Mt. Rose	10,000	4/6–7	93.6	40.6	38.0	(45)	84.4	90.7
Lower Levels								
Boca No. 2	5900	3/29	18.4	25.5	4.7	(9)	52.2	61.1
Truckee No. 2	6400	4/1	55.3	34.7	19.2	(20)	96.0	78.0
Donner Lake	5950	4/1	74.6	37.9	28.3			
Truckee Ranger Station	6000	3/28	31.0	38.4	11.9			
Tahoe City	6250	4/1	40.0	32.2	12.9	15.9	81.1	55.3
TAHOE BASIN								
Chest—Main Sierra								
Ward Creek	7000	4/16	101.1	50.6	51.2	51.2	100.0	91.2
Rubicon Peak No. 1	8100	4/6	134.6	37.3	50.2	48.9	102.7	
Rubicon Peak No. 2	7500	4/6	97.6	39.2	38.3	(36)	106.4	
Lake Lucile	8400	4/14	147.6	42.8	63.2	61.2	103.3	93.5
zEcho Summit	7500	4/2	127.7	39.8	50.9	(42.5)z	119.7	94.8z
Eastern Outposts								
Mount Rose	10,000	4/6–7	93.6	40.6	38.0	(45)	84.4	90.7
Marlette Lake	8000	4/1	87.2	36.0	31.4	27.8	112.9	97.5
Hagan's Meadow (Freel Peak)	8000	4/19	40.8	40.0	16.3	21.2	76.9	86.8
Lower Levels								
Tahoe City	6250	4/1	40.0	32.2	12.9	15.9	81.1	55.3
Rubicon Peak No. 3	6700	4/6	77.8	36.4	28.3	(30)	94.3	
Richardsons	6500	4/13	27.9	36.9	10.3	(13)	79.2	63.1
Richardsons No. 2	6500	4/13	44.6	40.6	18.1			
Upper Truckee	6400	4/19	4.6	39.2	1.8*	(11)	16.4	95.5
Freel Bench	7300	4/19	13.5	41.5	5.6§	(15)	37.3	70.0
Daggett's Pass	7350	4/13	37.6	38.8	14.6	16.3	89.6	85.3
Glenbrook No. 2	6900	4/13	51.3	36.6	18.8	(20)	94.0	75.0
WASHOE VALLEY								
Marlette Lake	8000	4/1	87.2	36.0	31.4	27.8	112.9	97.5
Little Valley	6300	4/2	25.3	36.8	9.3			
CARSON BASIN								
Crest—West Carson								
xCarson Pass	8600	3/22	83.5	40.6	33.9	(48)	70.6	84.0
Blue Lakes	8000	4/3	114.3	35.5	40.6	48.1	84.4	84.6
East Carson								
‡Poison Flat	7900	3/28	30.4	35.6	14.8‡	(18)	82.2	102.8
WALKER BASIN								
West Walker								
Sonora Pass	8800	4/4	79.7	35.6	28.4	(31)	91.6	88.1
Leavitt Meadows	7200	4/4	25.8	29.5	7.6	(16)	47.5	73.1
Willow Flat	8250	4/5	41.8	33.4	14.0	(16)	87.5	
East Walker								
Center Mountain	9400	4/3–4	110.5	18.8†	20.8†	45.7	45.5†	100.7
Buckeye Forks	8500	4/2	67.0	31.3	21.0	26.0	80.8	83.1
Buckeye Roughs	7900	4/2	63.4	29.3	18.6	25.9	71.8	78.0
Dunderberg Peak	8400	4/5	60.3	30.5	18.4	(45)	40.9	49.3
MONO BASIN								
Crest								
Tioga Pass	9900	4/1	85.5	37.5	32.1	(31)	103.5	111.6

* Exceedingly heavy melting. Snow on only 7 samples out of 23.

§ Also very heavy melting, partly bare.

x If survey made April 1 it would, no doubt, have been about the same as for Blue Lakes.

‡ The storm after the survey was made, March 28, added 4 inches to the water content, bringing it up to 14.8.

† Results not too accurate, 15 inches of ice blocking the tube.

z New normal.

FORECAST — CENTRAL SIERRA — EASTERN SLOPE

APRIL-JULY, 1946

Basin or Stream	Normal Feet	SEASONAL FORECAST Probable % of Normal	Probable Amount	Possible Minimum % of Normal	Possible Minimum Amount
			Feet		Feet
Rise of Tahoe—April 1 to High Water	1.68	101.2	1.70	89.3	1.50
*Maximum Elevation of Tahoe with Gates Closed (July 15)			6229.45		6229.15
†Maximum Elevation of Tahoe with Gates Regulated			6229.10		
			Acre Feet		Acre Feet
‡Truckee Exclusive of Tahoe (Natural Flow)	325,700	97.6	318,000	89.1	290,000
Carson River at Fort Churchill	230,000	65.2	150,000	52.2	120,000
West Walker near Coleville	191,200	78.5	150,000	68.0	130,000
§East Walker near Bridgeport Dam	73,000	89.0	65,000	68.5	50,000

* Assuming gates kept closed.

† When necessary gates are opened so that elevation of lake will not exceed 6229.1.

‡ Corrected for changes in Little Truckee Reservoir storage and Donner Lake.

§ The forecast period for the East Walker is April-August because of late melting of snow in high altitudes and on the Northeastern slope of the Sawtooth Range west of Bridgeport.

Distribution of April-July Runoff in Typical Streams—Per Cent of Total April-July Runoff

	Truckee at Farad Excl. of Tahoe	Carson at Clifton	West Walker at Coleville
April	32	19	11
May	38	36	29
June	23	34	37
July	7	11	23
April-July	100.0	100.0	100.0

A retardation in the earlier months of the series assures an increase in the later months and vice versa.

Table A, below, shows what Lake Tahoe is able to supply at various elevations with gates wide open. Table B, below, shows the need of drawing from the lake or other storage during the summer and fall to maintain a flow of 500 cubic feet per second at Farad.

A. Draft Possible at Various Elevations:

Elev. (Ft.)	Draft (C.F.S.)	Elev. (Ft.)	Draft (C.F.S.)
6223.0	0	6225.5	520
6223.5	23	6226.0	730
6224.0	88	6227.0	1160
6224.5	183	6228.0	1600
6225.0	325	6229.0	2060

One foot depth on Tahoe is equivalent to 123,000 Acre Feet.

B. Natural Flow of Truckee River at Farad, Exclusive of Tahoe (Much Affected by Rains) August-October:

	Normal Acre Feet	Second Feet
August	7485	122
September	5800	97
October	6545	106

WINTER PRECIPITATION

*Typical Progress through winter for Central Sierra Region:

Dec.-March Date	Dec.-March % Due	Nov.-March % Due	Nov.-March Date
Dec. 1	0	12	Dec. 1
Jan. 1	21	31	Jan. 1
Feb. 1	50	57	Feb. 1
Mar. 1	76	79	Mar. 1
Apr. 1	100	100	Apr. 1

†Seasonal Progress

Tahoe City
Nov.-March, 1945-46

Date	% of Seasonal	Actual Inches	% of Normal Due
Dec. 1	19	4.85	166
Jan. 1	63	15.99	214
Feb. 1	71	18.01	132
Mar. 1	82	20.80	95
Apr. 1	100	25.33	102

*Based on U.S.W.B. Revised Normals, % Due being averages for nine U.S.W.B. Stations in Central Sierra.

†Percent of Normal Due based on U.S.W.B. Revised Normals for Tahoe City.

Nov.-March normal.....24.81

Dec.-March normal.....21.89

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Reno, Nevada, April 26, 1946.

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